Grassland Progress

U.S. DEPARTMENT OF AGRICULTURE, LAND-GRANT COLLEGES, AND COOPERATORS

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Grasslands Exhibit The first exhibit of its kind on grasslands was viewed in the patio of the United States Department of Agriculture, here, May 10 to 26. The extensive display resulted from the combined effort of several Department services and some 3 or 4 States.

In addition to the live specimens and other timely factual displays by the Research Center at Beltsville and the Mountain Experiment Station of Georgia, there were State contributions of unusual interest. The nationally famous 60-foot display of grasses and legumes from South Dakota attracted particular attention. Two States, Maryland and Virginia, cooperated on educational exhibits. Prince William County, Va., showed how the grasslands program in a county is planned and carried out by a county pasture committee. The Maryland exhibit showed how a grasslands program is planned and put into practice on an individual farm.

The Office of Exhibits will have portions of the exhibit made into portable sections that can be lent to State and county fairs. Anyone interested should write to H. T. Baldwin, Exhibits Service, Office of Information, United States Department of Agriculture, Washington 25, D. C.

North Carolina's Grassland Program Continuing on its 5-year grassland program, North Carolina is well along toward its goal of getting 2 million acres of highly improved pasture. For a long time alfalfa has been one of the basic legumes for hay, but now with Ladino clover it has a copartner in pasture mixtures that stands up well with the better grasses. Lespedeza in many areas of the State is the third legume of importance in mixtures. The grasses of merit consist of orchard, fescue, Bermuda, dallis, and others.

The green-pasture program has been highlighted through a statewide contest now in its fourth year. Ladino clover was used as a benchmark to gage the degree of compliance and interest in developing pastures. In their effort to get a million acres of Ladino clover pastures, farmers who have as much as 1 acre of Ladino for each animal unit on the farm receive a certificate from the State committee, signed by the Governor. If the farmer has as much as $1\frac{1}{2}$ acres of Ladino clover for each animal unit he is awarded a large metal sign with the challenging words "Honor Farm" to post on his farm gate. The county in each district with the greatest number of honor farms is awarded a large banner to place on the flagpole at the courthouse.

Blue Streams, Green Fields State's Need (Excerpts from an editorial in the Atlanta Journal, May 13, 1954) "Pastures figure importantly in the fortunes of every man, woman, and child in Georgia . . .

Georgia has made more progress in pasture development in the last 20 years than any other State. Georgians have learned to pack the soil with organic matter, so that rains are soaked up by the ground. They have learned the values of cover crops with roots that go deep to clutch the soil. . . .

Row crops and idle land are erosion's allies. In some of the Northern and Midwestern States the soils have the fertility to grow row crops with greater density than here in Georgia. That's one reason why streams there are blue, while streams in the eroded terrain of the deep South are constantly dyed with muddy tints. Grasses and trees help conserve our soil, but row crops let it slip away to the nearest stream.

Georgia now has 3 million acres of permanent pastures, while in 1925 the total was 800,000 acres. Extension experts estimate the State has 1,500,000 acres of improved pastureland. This is land capable of carrying a cow per acre, something almost unheard of only a few years back. . . .

Georgia has a head start in this exciting business of holding our soil, turning the landscape green and the streams blue. Our soil needs nitrogen and plants with roots that bore

deeply and cling. Let us emphasize the cover crops that make the organic matter, that holds the water, that otherwise would trickle off with its ransom of topsoil.

If we keep everlastingly at it, some day our streams will be as blue as the ribbons Georgia cattlemen are winning with the aid of their greener pastures."

Coastal Bermuda Production Coastal Bermuda, a highly productive hybrid, was developed by Dr. G. W. Burton, principal geneticist, United States Department of Agriculture, Georgia Coastal Plain Experiment Station, Tifton, Ga. It was produced from the crossing of tall strains of South African Bermuda, and Tift Bermuda. Coastal Bermuda carries a great deal of hybrid vigor, that mysterious force that makes hybrid corn yield more than open-pollinated varieties. It also grows taller, spreads faster, and has longer leaves and stems than common Bermuda. Cattle have consistently grazed it in preference to common types, and chemical analysis indicates that it is equal or superior to common Bermuda in food value. Other qualities, not known at the time it was bred, destined it to become one of the most outstanding pasture plants of the Southeast.

Over a 5-year period ending in 1948, Coastal Bermuda produced an average of 116 pounds more beef per acre than common Bermuda growing in adjacent pastures. Both pastures were fertilized with 600 pounds per acre of 0-12-6 every third year and 36 pounds of actual nitrogen per acre annually. Numerous reports from farmers also indicate that it is superior to common Bermuda throughout most of the Bermuda-grass belt.

In a carefully controlled experiment carried out at Tifton in 1952, clippings removed from Coastal Bermuda, common Bermuda, and Pensacola Bahia contained 63.6, 34.8, and 53.5 percent, respectively, of the nitrogen fertilizer applied. These results indicate that Coastal Bermuda is more efficient than the other two grasses in the use of fertilizer, particularly nitrogen.

Extra nitrogen applied to Coastal Bermuda pastures at the Georgia Coastal Plain Experiment Station produced 2 pounds of beef per pound of nitrogen up to 200 pounds of nitrogen per acre. This 200-pound rate plus some phosphorous and potash produced 685, 697, and 655 pounds of gain per acre, during the past 3 years. These results are the basis for the recommendation, "Fertilize with nitrogen to produce the feed you need."

Over a period of years at Tifton, Ga., Coastal Bermuda has produced 8 tons of hay per acre per year when fertilized with 400 pounds of nitrogen (1,200 pounds of ammonium nitrate) per acre and adequate amounts of phosphorous and potash. Without fertilizer it produced 1 ton of hay per acre per year.

Fight the Grasshoppers In addition to the damage they cause to rangeland, grasshoppers destroy many tons of valuable forage crops each season, especially in arid or semiarid regions. It pays to control them with timely applications of insecticides. Use aldrin at 2 ounces, heptachlor at 4 ounces, chlordane at 1 pound, or toxaphene at $1\frac{1}{2}$ pounds per acre. Apply the given per-acre dosage of one of the insecticides in 1 gallon of kerosene or fuel oil, or mix it in a quantity of water to suit the output of available spraying equipment--or dust with one of the insecticides by increasing the dosage per acre by 50 percent. Treat field margins, ditchbanks, patches of weeds, or uncut strips of forage crops where grasshoppers have concentrated. Kill the 'hoppers before they move into grassland crops. USDA Program Aid No. 149 tells how to use insecticides for grasshopper control.

Pasture Survey of Indiana Farms A survey of farmers, including their practices adopted in pasture improvement, was made during 1953 in 26 southern Indiana counties. The purpose was to find out what practices had been tried and found most successful.

Among seeding methods used, broadcasting was favored for early spring or late winter seeding; those seeding later or with small grains favored using the drill. Forty percent of those using the drill, band-seeded the legumes. Almost an equal number used the cultipacker seeder.

The rate of fertilization at the time of seeding ranged from 200 to 1,000 pounds per acre. The analyses used ranged from super or rock phosphate to mixtures of phosphate and potash or complete fertilizer. About 2 out of 3 used a complete fertilizer, 1-4-4 ratio prevailing, and most of the remainder used 0-20-20. Only two used rock phosphate.

For the maintenance of established stands, 15 different rates and analyses of fertilizers were reported, ranging from 200 to 700 pounds per acre. About an equal number reported applying the fertilizer annually or every 3 to 5 years. A few used manure only, and of the remainder about the same number reported phosphate-potash or complete fertilizer mixtures.

About the same number of farmers reported seeding legumes in each of the three seasons of the year, in late winter, early spring, or late summer or early fall. Grasses were seeded most frequently in the fall. Eight legume and eight grass species were reported used in forage mixtures. The legumes used were alfalfa, Ladino clover, Korean lespedeza, and red clover. Among lesser-used legumes birdsfoot trefoil, alsike clover, sweetclover, and big trefoil were reported. The most popular grasses were orchardgrass, tall fescue, timothy, and smooth brome. Others used by a few

were Kentucky bluegrass, redtop, ryegrass, and reed canarygrass.

Diseases of Grass and Legumes It has been estimated that diseases of forage grasses and legumes cause losses of more than 1 billion dollars annually. These staggering losses occur because we still do not have resistant varieties or adequate measures of control for the great majority of plant diseases that attack our forage crops. Diseases are active at all stages of plant growth from the time the seeds are sown until the crop is harvested or plowed under. It is sometimes difficult to visualize any loss from plant diseases in a nice, green pasture or hayfield, but many pathogens work inconspicuously. Throughout the growing season and even during periods of dormancy a series of disease organisms can attack the plants, each working for a time and then giving way to an ally. The first disease may cause a leaf spot, the next a stem blight or canker; another may cause a rust and still another a root rot. Each in itself may do only moderate damage, but collectively they can kill the plant prematurely or so weaken it that it cannot withstand a period of drought or an unfavorable winter. Occasionally a disease develops so seriously in some areas that it becomes a limiting factor in growing the crop. Until resistant varieties or other measures were developed, diseases such as bacterial wilt and stem nematode of alfalfa, southern anthracnose of red clover, leaf blight of Sudangrass, and blind seed disease of annual ryegrass discouraged many farmers from planting these crops.

The efforts of the Agricultural Research Service and State researchers are aimed at preventing other diseases from reaching such destructive proportions. Diseases such as Sclerotinia crown rot of alfalfa and the clovers, the virus disease complex of Ladino and red clovers, root rot of red clover, leaf spot of smooth brome, rusts of orchardgrass and annual ryegrass, and ergot of dallisgrass are problems of concern in which progress is being made.

Occasionally, new and potentially dangerous diseases suddenly break out in some area. Two such diseases of great immediate concern to growers and research workers alike are (1) the destructive virus disease of sweet yellow lupine that threatens to curtail continued use of this valuable forage legume in the Southeastern United States and (2) the dwarf bunt disease discovered in 1952 in seed fields of several grasses in the Pacific Northwest.

It takes continued vigilance to anticipate the development of a serious plant disease and years of research and effort to control it once it becomes established. An annual loss of a billion dollars is quite a challenge, but the growing interest in improved forage crops should stimulate increased research to overcome some of our worst plant disease enemies.

California's Grassland Progress In its ever-widening search for answers to grassland problems the University of California, through its agronomy specialists and with the help of the California fertilizer industry, set up a series of four field-scale tests to ascertain through cooperative farm demonstrations on rangelands the best and most economical materials in producing forage convertible into meat. The western region with comparable areas will be watching the outcome of these tests.

Another grassland management practice, rotation grazing, in California is likewise being watched across the Nation. This relatively new practice (consisting for the most part of 50 cows per acre for a day's ration) is gaining considerable favor among livestock people. It was employed by 125 dairymen and a few beef cattle feeders during the 1953 grazing season, and all reported uniformly outstanding results. The many advantages claimed for this new system include increased production, better weed control, good beef cattle gains and a more uniform day-to-day milk flow from the dairy herd, opportunity for making hay or silage from the surplus spring growth, reduced bloat hazards, higher quality feed, and better control of internal parasites.

Rodents, feeding and burrowing on rangelands, can reduce forage production by 25 percent, according to studies by zoologists at the California station's San Joaquin Experimental Range. Control of ground squirrels, pocket gophers, and kangaroo rats on cattle and sheep ranges results in increased livestock feed and higher potential beef weights.

Wisconsin's Rotation Grazing Plan This plan calls for using from 10 to 30 pastures, which are grazed from 1 to 3 days, their size being determined by the size of the herd and length of time for each grazing. The plan also calls for reserving some sod pasture to care for the herd on days when it is too wet to graze new stands of grass and legume mixtures. University of Wisconsin agronomists suggest a fencing plan based on 24 cows, 24 acres of a 50-50 grass-legume mixture, and each division pastured for 2 days at a time.

"Join the Crusade for Grass" As a means of making the public conscious of the importance of grass in our economy, Mississippi is inviting other States to join in the use of its new slogan "Join the Crusade for Grass." It is believed that business and professional leaders, as well as newspapers and the farm press, could well use this slogan in helping others to be conscious of better grasslands.

Sod-Seeding Machine Mississippi State College and equipment manufacturers have developed a sod-seeding machine that seeds grasses, cereals, and legumes in pasture sod and places fertilizer and lime below or in bands to the

side of the seed with minimum damage to the sod. The machine is claimed to seed other close-growing crops in the regular seeding practices, as well as overseeding of oats with Sudan or millet, or applying fertilizers in cereals. It is used by many farmers to seed in sod where they do not have time to prepare a regular seedbed and often prevents seed being thrown out on top of the ground.

Crawfish and Weed Control In parts of the South crawfish are a nuisance, especially on poorly drained land. The Mississippi Experiment Station has effectively controlled them in pastures with DDT at the rate of 2 pounds an acre. It is applied as a spray using 1 gallon of 25-percent emulsion in enough water to cover an acre, or 20 pounds of 10-percent DDT granular insecticide per acre. The most effective control of weeds in pasture consists of 2/3 to 1 pound of amine 2,4-D per acre in 20 gallons of water sprayed broadcast. Two applications (May and July) have been sufficient to control such plants as bitterweed, tarweed, ragweed, primrose, and dock. The most effective control of wild onion was maleic hydrazide at the rate of 3 pounds (1 gal. MH-40) in 20 gallons of water. Honeysuckle vines were best controlled by the use of a "brush killer" (2,4-D and 2,4,5-T).

North Dakota Grasslands

	Acres
Tame grass for pastures	935,210
Native grass for pastures	10,734,757
Government land grazing	1,000,000
Native grass for hay	2,460,106
Total	15,130,073

Utilization of native grass pastures by the 50-50 rule.

(1) The 50-50 rule: The utilization of not more than 50 percent by weight of the available forage in any one grazing season permits the pasture to approach its maximum potential production.

"Take half and leave half--and the half that you take gets bigger and bigger."

(2) Evidence of possible increases in grazing capacity:

South Dakota trials--4 years. Pastures grazed to 48 percent utilization produced 40 percent more forage than those grazed to 60 percent utilization.

Pastures grazed to 60 percent utilization produced 31 percent more forage than those grazed to 74 percent utilization.

Pasture Irrigation in Alabama A cooperative experiment to determine the value of irrigating pastures for beef production was started in Alabama in the fall of 1951. The effect of irrigation on growth of the various pasture plants, maintenance of stands of clover and grasses, and yield of beef are being studied. The value of nitrogen topdressing is also being determined.

For establishment of the pastures, 2 tons of ground limestone per acre was applied. Fertilizer treatments are given in the yield table below. The pasture mixture consisted of dallisgrass and white clover broadcasts, with tall fescue drilled in 20-inch rows.

Insecticide Not Excreted Into Milk The new insecticide methoxychlor, sprayed in recommended quantities on pasture and grassland, will not harm dairy cows that feed on the treated forage, nor will it be excreted into their milk, according to experiments carried out by the United States Department of Agriculture.

Irrigated Pastures in Oregon At Corvallis, in western Oregon, the experimental irrigated pastures on the station turned off 6.08 tons of hay equivalent from Ladino and grass and only 4.82 tons from the same grasses without the legume. In terms of beef, the actual beef gain per acre with 550-pound steers was 810 pounds on the grass-Ladino and 479 pounds on grass alone. Animals received no other feed except pasture, and there was no bloat.

The grass mixture in both cases was Alta fescue, orchardgrass, meadow foxtail, and

Alabama forage and beef yields from irrigation, fertilization grazing experiment, 1952-53

Fertilizer and irrigation treatment	2-year forage average	2-year beef average
	Pounds	Pounds
500 lbs. 0-16-8 No irrigation	3,377	206
500 lbs. 0-16-8 Irrigated	6,060	362
1,500 lbs. 0-16-8 No irrigation	3,256	191
1,500 lbs. 0-16-8 Irrigated	6,684	399
1,500 lbs 0-16-8+N No irrigation	4,654	316
1,500 lbs. 0-16-8+N Irrigated	6,224	393

Tualatin oatgrass. Nitrogen was used as follows: 40 pounds preceding October; 80 pounds in March; 40 pounds in June; 33 pounds in August, or a total of nearly 200 pounds actual nitrogen for the season. P_2O_5 used was 60 pounds--all in the fall. Cattle were on each pasture 1 week, off 2. Pasture was good until the last of September, but after that they lost weight unless grained.

Results from Squaw Butte (Oreg.) Research Station 1. In range reseeding, rolling the seedbed, then seeding with depth-regulating bands on the drill disks gave the best stands with crested wheatgrass. 2. Spraying big sagebrush with 1 pound of butyl ester of 2,4-D killed 70 percent or more and resulted in 400 to 500 pounds more usable forage per acre.

Illinois Grasslands Progress Calves wintered on grass silage with a small quantity of shelled corn produced gains costing less than $13 a hundredweight.

Two trends are of further significance in Illinois: (1) Using grass silage as feed insurance in dry years and (2) storing silage in such a manner that it may be self-fed. As in other States, most farms are understocked on good pastures in May and June, but if dry spells occur, they have too much livestock in August. Making extra pasture into grass silage levels out the supply of forage. When the pasture season is favorable the silage is saved for winter feed. If pastures get short, silos are opened, grass silage is fed, and the silo can be refilled with corn silage. Self-feeding silage is becoming more and more popular. One farmer self-fed 130 calves last winter from a stack of grass silage 30 feet wide and 100 feet long. Feed gates were placed across each end. Less than $\frac{1}{2}$ hour a day was spent in feeding the cattle.

The educational phase of the program is under the general direction of a college-wide legume-grass committee, which carries on district or county level demonstrations. Winter silage tours and special talks on silage during Farm and Home Week have created unusual interest.

Virginia's 12-Month Feed Plan A 12-month feed plan may be one of the answers to the farmer's continual battle against nature.

Such a plan, in which various mixtures are used flexibly for grazing, silage, or hay, has been set up at the Middleburg branch of the Virginia station and is being compared to the more familiar practices of continuous grazing.

The two test units are set up in 3-acre fields. The experiment was begun in August 1952.

The daily liveweight gains of steers under continuous grazing and rotational grazing among several mixtures were similar. The 12-month feed plan carried more animals per acre than the continuous grazing plans.

Data for the season of 1953 show that on continuous grazing steers gained 1.35 pounds daily; on the 12-month plan with rotational grazing, and silage and hay management of mixtures, they gained 1.26 pounds.

Continuously grazed pastures carried 4.9 steers per day for 550 steer days for a gain of 741 pounds per 3 acres. Under the 12-month feed plan, pastures carried 3.7 steers per day for 418 steer days for a gain of 526 pounds per 3 acres.

The 12-month plan had an additional value, however; $17\frac{1}{2}$ tons of silage and $1\frac{1}{2}$ tons of hay were harvested for winter feed from the 3-acre area. This silage and hay should carry 5-1/3 600-pound steers for 150 days during the winter and produce more than 650 pounds of liveweight gains.

The mixtures and method of use in the 12-month feed plan were: Orchardgrass-Ladino clover-bluegrass-white clover-red clover, used for grazing; orchardgrass-lespedeza, used for grazing; orchardgrass-red clover-Ladino clover, the first cutting used for silage and then for grazing- alfalfa-Ladino clover-orchardgrass, first cutting for silage, the second and third growths for hay, and the last growth for grazing; alfalfa-orchardgrass, the first cutting for silage, the second and third growths for hay, and the last growth for grazing.

The continuously grazed pastures were sown with a mixture of orchardgrass, Ladino clover, bluegrass, white clover, and red clover.

Wyoming Brush Control Chemical sagebrush control needs tailoring to suit individual ranch operations, according to agronomists at the Wyoming station. In some situations, such control should not be used.

Points in favor of chemical sagebrush control: (1) Grass output will nearly double within 2 years after treatment. (2) It's economical, costing about $3.50 an acre. (3) It will give more open area, allowing stock to graze more efficiently. (4) Killing sagebrush in dryland areas leaves more water for grasses. (5) More grass production increases spring rangeland. (6) Snow cover, in the long run, is not changed, because grass growth increases as the sagebrush dies out.

Possible bad features of chemical sagebrush control: (1) Stock may so strongly favor increased grass growth in sprayed areas that they overuse it. (2) Sheepmen in fall-winter range areas may depend heavily on sagebrush for forage. (3) Spraying land without a good understory of grass can cause serious loss of forage plants--chemical sprays kill many broad-leaved plants in addition to sage. (4) Killing sagebrush in hilly country with shallow soils can leave land exposed to erosion. (5) For some ranches, extra range can be obtained more cheaply by purchase of additional land than by spraying sagebrush now on the ranch.

Halfway ground between the good and bad features may be strip spraying.

Texas Brush Control In 1951 the Texas station began a study to determine the effects of removal of tree cover on the production of native forage in an oak woodland type. It was found that tree removal increased forage production in proportion to the amount of overstory deadened. On an area with a good initial stand of desirable forage plants, yields following reduction to a 13-percent canopy were 5 times as great as those on untreated check areas. The amount of forage eaten by cattle was proportional to the amount of overstory deadened. This selective grazing emphasizes the importance of controlling brush over an entire pasture to prevent the concentration of grazing animals in cleared areas. Costs of complete removal by deadening with 2,4,5-T were $27.23 per acre, of which about one-half was for materials. The increased forage production, assuming the use of 50 percent of the total forage produced as hay valued at $25 a ton, would pay the total cost of treatment in less than 5 years.

Fertilizer for Pasture

Estimated average amount of plant food applied per acre of pasture, United States[1]

Year	Pounds N	Pounds P_2O_5	Pounds K_2O	Pounds total
1927	(2)	(2)	(2)	----------
1938	(2)	(2)	(2)	----------
1942	0.4	1.2	0.5	2.1
1946	0.6	1.2	0.6	2.4
1949-50	0.6	2.4	1.3	4.3
1951-52	1.8	2.8	2.0	6.6

[1] Supplied by National Fertilizer Association.
[2] Too low for estimate.

GRASSLAND PUBLICATIONS (Copies available from issuing agency. Please do not write to us for copies.)

Arkansas Extension Service: Leafl. 201, Pasture Plans for Year-Round Grazing in the Coastal Plains.
California Extension Service: Improve Your Range With Harding.
Georgia Experiment Station: Tech. Bul. 3, Factors Involved in Forage Quality for Dairy Cows.
Illinois College of Agriculture: Grass Silage in Stacks and Trenches.
Illinois Cooperative Crop Reporting Service: Illinois Agricultural Statistics, Forage Use in 1951.
Illinois Experiment Station: A Good Way to Good Pastures.
Grazing Value of Mixed Legumes and Grasses.
Soil Treatment for Pasture Grasses and Legumes.
Cornell Experiment Station, New York: Bul. 890, Use of Pasture for Fattening Steers.
North Carolina Experiment Station: Bul. 342 (rev.), Some Stock Poisoning Plants. Bul. 383, Nitrogen in Forage Production.
North Carolina Extension Service: Ext. Folder 67 (rev.), Graze Hogs for 12 Months.
Ext. Folder 77, Bloat in Cattle and Sheep.
Ext. Folder 94, Grazing Crops for Poultry.
Ext. Folder 107, Cautions With 2,4D, 2,4,5-T, MCP, in Weed Control.
North Dakota Extension Service: Cir. A-139 (rev.), Grass Seed Production.
Cir. A-207, Grow Sudangrass for Summer Pasture.
Cir. A-209, Grow Better Pastures With Grasses and Legumes.
Cir. A-210, Make Pastures Pay, Cash in With Better Pastures.
Oklahoma Experiment Station: Bul. B-416, Midland Bermuda Grass a New Variety for Oklahoma Pastures.
Cir. C-137, UREA as a Source of Protein in Livestock Rations.
Forage Crops Leafl. 10, Lawns for Town and Country.
Forage Crops Leafl. 11, King Ranch Bluestem.
Forage Crops Leafl. 13, Broomsedge.
Forage Crops Leafl. 14, Bermuda-grass.
Forage Crops Leafl. 16, Weeping Lovegrass.
Forage Crops Leafl. 17, Indian Grass.
Forage Crops Leafl. 18, Side-Oats Grama.
Tech. Bul. T-48, Performance of Weeping Lovegrass Under Different Management Practices.
Oklahoma Extension Service: Crops To Plant on Diverted Wheat Acres.
Cir. 507, Lespedeza a Good Pasture Plant.
Cir. 599, The Trench Silo in Oklahoma.
Cir. 610, Soil Improvement Crops for Diverted Acres.
Pennsylvania Experiment Station: Bul. 573, Diseases of Forage Grasses and Legumes in the Northeastern States.
South Carolina Experiment Station: Bul. 410, Tall Fescue and Ladino Clover Pasture for Dairy Cattle.
South Dakota Experiment Station: Bul. 427, Grass and Legume Strains.
Texas Extension Service: L-193, Establishing a Coastal Bermuda-grass Nursery.
Virginia Extension Service: Cir. 505, Winter Pastures With Cover Crops.
Cir. 585, Managed Grazing Pays.
Washington Experiment Station: Sta. Cir. 183, Economic Effects of a Grass-Legume Rotation in Palouse Wheat-Pea Area.
Sta. Cir. 225, The Effect of Nitrogen on the Yield of Old Established Pastures.
Washington Extension Service: Ext. Cir. 213, Big Trefoil.
Ext. Cir. 231, Montgomery Red Clover and Drummond Timothy.
Ext. Cir. 232, Topar Pubescent Wheatgrass.
Ext. Misc. Pub. 4, Preservatives for Grass Silage.
U. S. Department of Agriculture: Agr. Inf. Bul. 106, Our Productive Land.
Cir. 908, The Mesquite Problem on Southern Arizona Ranges.
Farmers' Bul. 1722, Growing Alfalfa.
Farmers' Bul. 1924, Reseeding To Increase the Yield of Montana Range Lands.
Farmers' Bul. 2056, Reseeding Southwestern Range Lands With Crested Wheatgrass.

Items or publications for Grassland Progress should be addressed to L. I. Jones, Federal Extension Service, United States Department of Agriculture, Washington 25, D. C.

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